



Fire Fuel Load Effects on Heat Dosage and Perennial Plant Response

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Fire is thought to affect plant mortality through the magnitude and duration of heat exposure, but tests of these factors using specified amounts of fine fuel are lacking. Individual plants of *Hesperostipa comata*, *Carex filifolia*, *Bouteloua gracilis*, and *Pascopyrum smithii* were collected from the field, potted, and acclimated to greenhouse conditions. Plants were exposed to fire in a 1-by-0.5-m cage using 500-4500 kg/ha fuel loads of native fine fuels in 500 kg/ha increments or not burned. Temperatures during fire were recorded every second using thermocouples at the soil surface. Thermocouple data were used to determine maximum temperature and heat dosage ($^{\circ}\text{C} \times \text{seconds}$). Following fire, plants were returned to the greenhouse and watered to maintain good growing conditions. Standing crop and pre- and post-fire live tiller counts were used to assess plant response. Heat dosage ranged from 3,647 to 22,687 $^{\circ}\text{C}\cdot\text{s}$ and mean maximum temperature ranged from 359 to 560 $^{\circ}\text{C}$. Fuel load was positively related to heat dosage and maximum soil surface temperature, explaining 77 and 34% of the variation in each, respectively. Across fuel loads, fire reduced live tiller counts of *Carex filifolia*, *Bouteloua gracilis*, and *Pascopyrum smithii* immediately following fire, but *Hesperostipa comata* was not affected in the short term. The relationship between fuel load and heat dosage along with plant response offer opportunities to improve the understanding of fire, predictions of plant response to wildfire, and prescribed burning.

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